HandyScan
from GSSI
User's Manual

The World Leader in Subsurface Imaging™

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Before returning any equipment to GSSI, a Return Material Authorization (RMA) number must be obtained. Please call the GSSI Customer Service Manager who will assign an RMA number. Be sure to have the serial number of the unit available

FCC Notice (for U.S. Customers):

This device complies with part 15, class F of the FCC Rules:

Operation is subject to the following conditions:

1. This device many not cause harmful interference, and
2. This device must accept any interference received, Including interference that may cause undesired operation

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Operation of this device is restricted to law enforcement, fire and rescue officials, scientific research institutes, commercial mining companies, construction companies and private parties operating on behalf of these groups. Operation by any other party is a violation of 47 U.S.C. § 301 and could subject the operator to serious legal penalties.

Coordination Requirements

(a) UWB imaging systems require coordination through the FCC before the equipment may be used. The operator shall comply with any constraints on equipment usage resulting from this coordination.

(b) The users of UWB imaging devices shall supply detailed operational areas to the FCC Office of Engineering and Technology who shall coordinate this information with the Federal Government through the National Telecommunications and Information Administration. The information provided by the UWB operator shall include the name, address and other pertinent contact information of the user, the desired geographical area of operation, and the FCC ID number and other nomenclature of the UWB device. This material shall be submitted to the following address:

Frequency Coordination Branch, OET
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554
ATTN: UWB Coordination

(d) Users of authorized, coordinated UWB systems may transfer them to other qualified users and to different locations upon coordination of change of ownership or location to the FCC and coordination with existing authorized operations.

(e) The NTIA/FCC coordination report shall include any needed constraints that apply to day-to-day operations. Such constraints could specify prohibited areas of operations or areas located near authorized radio stations for which additional coordination is required before operation of the UWB equipment. If additional local coordination is required, a local coordination contact will be provided.

Notice: Use of this device as a wall imaging system requires the use of a "deadman switch" as supplied by GSSI.

For U.S. Customers

Ground Penetrating Radar Coordination Notice And Equipment Registration

Note: This form is only for Domestic United States users. The Federal Communications Commission (FCC) requires that all users of GPR who purchased antennas after July 15th, 2002 register their equipment and areas of operation. If you have purchased any of the antennas listed in question 6 after July 15th, 2002, you must fill out this form and fax or mail to the FCC.

Failure to do this is a violation of Federal law.

1. Date:

2. Company name:

3. Address:

4. Contact Information [contact name and phone number]:

5. Area Of Operation [state(s)]:

---Continued on next page.

6. Equipment Identification:

Brand Name: Geophysical Survey Systems, Inc.

Antenna Model No. (center frequency): *CHECK all antennas being registered.*

Model	Frequency	FCC ID
4105	2.0 GHz	QF74105
5100	1.5 GHz	QF75100
5101	1.0 GHz	QF75100
4108F	1.0 GHz	QF74108F
HandyScan	1.0 GHz	QF7HANDYSCAN
3101D	900 MHz	QF73101D
5103	400 MHz	QF75103
TerraVision	400 MHz	QF7TERRAVISION
5104	270 MHz	QF75104
5106	200 MHz	QF75106

7. Receipt Date Of Equipment:

Fax this form to the FCC at: 202-418-1944

Or

Mail to:

Frequency Coordination Branch, OET
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554

ATTN: UWB Coordination

Do not send this information to GSSI.

Certificate

To Whom it may concern:

This is to certify that electromagnetic radiation emissions from transducers (antenna with transmitting and receiving electronics) manufactured by Geophysical Survey Systems, Inc. (GSSI) DO NOT constitute a safety or health hazard to operating personnel.

Emissions from GSSI transducers are below the 10mW/cm² (100W/m²) level specified by the United States Occupational Safety and Health Administration (OSHA) regulations

> Paragraph 1910.97 states:
>
> "For normal environmental conditions and for incident electromagnetic frequencies from 100 MHz to 100 GHz, the radiation protection guide is
> 10 mW/cm² (milliwatt per square centimeter) as averaged over any possible 0.1 hour period."

Emissions data using GPR SIR System-10, SIR-2, SIR-3, SIR-4, SIR-8, SIR-20, SIR-2000 and SIR-3000 (at the standard Pulse Repetition Frequency of 100 KHz) with the antenna Models listed and levels of Electromagnetic Radiation are specified herein:

Following is the average power density data at 5cm and wide band.

ANTENNA (MHz)	AVERAGE POWER DENSITY (W/m^2 @ 5 cm)	OSHA SPEC. (W/m^2)
100	Less than 0.0001	100
200	Less than 0.0001	100
300	Less than 0.0001	100
270	Less than 0.0001	100
400	Less than 0.0001	100
500	Less than 0.0001	100
900	Less than 0.0001	100
1000	Less than 0.0001	100
1600	Less than 0.0001	100

GEOPHYSICAL SURVEY SYSTEMS, INC.

Alan E. Schutz

Engineering Director

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Introduction

HandyScan is a small-size, fully functional ground penetrating radar. It can instantly find the position and depth of metal and non-metal bars, pipes and cables. It works in natural and man-made non-conductive materials (concrete, rock, sand, brick, water, and ice). It can also locate voids and measure the thickness of walls, floors and other structural elements.

HandyScan allows the user to:

- **Collect** single lines of data (page 4) or grid data for plan viewing.
- **Review** data on screen, determine position and depth of features.
- **Print** data on the Seiko DPU-3445-20 printer supplied with the system.
- **Transfer** data to a PC in GSSI (*.dzt) format for storage and processing in RADAN software.
- **Display** plan views (Depth Slices) of grid data on a PC screen.

Specifications

Survey depth:	20-30 cm
Max survey length:	15 m
Size:	21 x 15 x 14.5 cm
Weight:	2.4 lbs
Display:	LCD, B&W w/back lighting
Battery life:	2 hours

HandyScan Layout

Screen displays data or setup table.

Battery status is shown in the top right corner.

Back Panel: On/Off switch
Serial port
External power connector (9V)

HandyScan Operation

1. Install a charged battery.
2. Turn power On (switch is located on the back panel).
3. Wait until data screen appears (about 15 sec).
4. Check battery indicator (top right corner of the screen).
5. If a low battery is indicated, turn system off and replace.

Using Setup Table:

1. Press Set on the keypad to display setup table, then:

- Up/down arrows to select a parameter,
- Left/right arrows to change it.

Disp. Direction	:	normal / invert
Disp. Mode	:	B / AB
Amplitude	:	abs / offset
X-axis	:	distance / time
Depth	:	ns / -3 to 3
Contrast	:	(number)
Date/time	:	05/10/2001
Data_No.	:	1
Dist adj.	:	+0 [0.00m]
Output	:	printer / computer
Baud rate	:	57600
Default	:	NO

Data Collection

1. Press and hold down Start button, you will hear a single beep that denotes that the system is ready for data collection.
2. Move unit forward.
3. Slow down if signal sounds when moving.
4. Release Start button and press Mark to insert a mark into data, press and hold Start button to continue collecting data. If the Start button is not depressed within ten seconds, the unit will close the data file.
5. Release the Start button and press the Down arrow to close file (double beep).

Start/Kill Switch

The Start switch also has a deadman switch function. The FCC requires that when the operator stops interacting with the system for ten seconds, the transmitter is to be shut off. This will also close the data file that you have been acquiring. Thus, you will need to keep the Start switch on the handle depressed at all times during data collection.

Note:

- Pressing Start one more time after you have collected a file will erase the previously collected data.
- Print the data or transfer them to a PC if you wish to keep the record before collecting the next line.
- The HandyScan can store 15 m (50 ft) of data. The unit will stop collecting data after this amount has been reached. You will need to start a new file to resume collecting data.
- The HandyScan displays axes in metric units only, but the same data can be later displayed using RADAN NT software on a PC in metric or English units.

Data Review

1. Use right/left arrow keys to scroll data.
2. Optimize data display:

- Press Gain until best display of features is achieved. Gain status is shown at bottom left (Gain can be used during collection as well).
- Press PRCS, then up/down arrow to change processing method. PRCS method used is shown
at bottom center.
- Use Set to modify display setup (contrast, amplitude, depth scale, etc.).

3. Label targets:

- Use arrow keys to move the cursors and locate targets. The cross-hair X (position) and Y (depth) are displayed in the top left corner.
- Press Mark to label a target and display its X-Y along the right edge of screen (up to 7 targets).

Note: It is possible to transfer non-grid data to a PC and review them on the PC screen, taking advantage of a higher quality display and (if installed) processing capability of RADAN software. Please see Data Transfer (page 7) and RADAN manual for instructions on processing.

Data Printout:

1. Install a charged battery in the printer.
2. Connect printer to the serial port (back panel) using the supplied cable and turn it On.
3. On setup screen, select Output to Printer.
4. Press Set to return to data screen
5. Press Print to print data.

Note: For more details see the User's Guide for Seiko Instruments printer model DPU-3445-20.

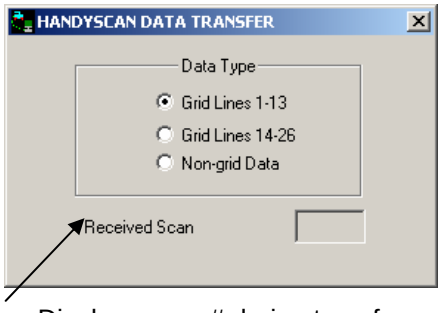
Data Transfer to a PC

Note: The file Handyfer.exe must be present on the PC.

1. Connect Handyscan and PC using a 9-pin null modem cable.
2. Start Handyfer.exe on the PC and select the appropriate data type (Grid Lines 1-13, 14-26 or Non-grid Data).

On Handyscan:

3. On setup screen, select Output to computer (binary).
4. Set baud rate to 57600.
5. Press Set to return to data screen.
6. Press Print.



Displays scan # during transfer

When the data transfer is finished, PC will prompt you to save data.

Collecting Grid Data

1. Secure the survey pad to the surface.
2. Start HandyScan as usual.
3. Make sure X-axis in setup table is set to distance.
4. Collect lines 1 to 13.

- Press Start (double beep) and transfer the data to the PC (see Transfer above).

5. Collect lines 14 to 26.

- Press Start (double beep) and transfer the data.

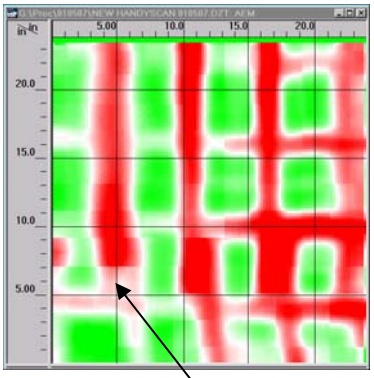
6. Save the grid file when prompted.

Notes:

- Start each line in the cross-hatched area (before the yellow contour).
- Stay centered on the line.
- Press Mark at the end of each line.
- At the end of line 13 and 26:
- Press Mark.
- Then press Start (double beep) to end the file.

Displaying Grid Data As Plan View

1. Complete grid data collection (above).
2. Open the grid file (*.dzt) in RADAN.
3. Click on StructureScan Process button .
4. Process and save the file (change the Radar Wave Velocity and repeat, if necessary, see next page).
5. Click on Depth Slices button .
6. Select desired Maximum Depth.
7. Drag a corner of the plan view to enlarge.
8. Right-click and select Display Gain (and slice thickness, if desired).
9. View depth slices using the Slice Depth box.
10. Use mouse cursor to determine positions of targets (see right). Use this information to mark targets on the paper pad.
11. Print the plan view or copy to clipboard as appropriate.

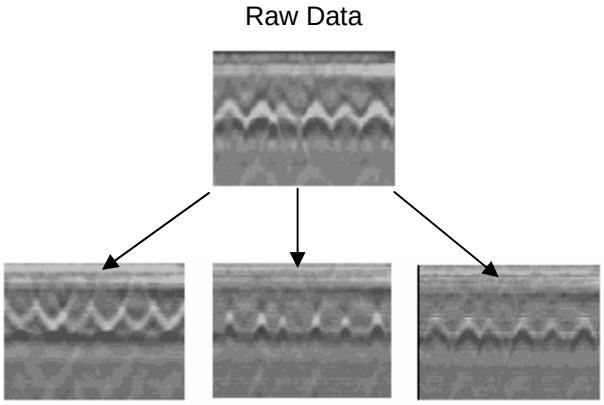


Radar Wave Velocity Adjustments

1. Automated processing includes Migration which removes hyperbolic reflections from the data. Migration requires Radar Wave Velocity to be set within ½ in/ns of the exact value.

2. The exact velocity is usually not known, thus trial-and-error is the best way to determine it:

- After first processing, maximize Display Gain and see if the hyperbolas have collapsed into dots:



- Correct velocity – data can be viewed in Depth Slices
- Velocity too high or too low – process again, respectively decreasing or increasing velocity in ½ in/ns steps until image looks correct.